

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Takanori ITOU et al.

Title: POSITIVE ELECTRODE
MATERIAL FOR NON-
AQUEOUS ELECTROLYTE
LITHIUM ION BATTERY AND
BATTERY USING THE SAME

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PRE-APPEAL BRIEF REQUEST FOR REVIEW

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Sir:

In accordance with the **Pre-Appeal Brief Conference Pilot Program**, announced July 11, 2005, this Pre-Appeal Brief Request is being filed together with a Notice of Appeal.

I. Status of the Claims

Claims 1-3 and 6 remain pending in the application, claim 1 being the only independent claim. Independent claim 1 reads:

1. *A positive electrode material for non-aqueous electrolyte lithium ion battery, comprising: an oxide containing lithium and nickel; and a lithium compound deposited on a surface of the oxide, wherein the lithium compound is lithium sulfate.*

II. Rejection of Independent Claim 1

Claims 1-3 and 6 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,071,649 (“Mao”) in view of U.S. Patent Publication No. 2003/0157490 (“Huang”) as evidenced by Japanese Patent Publication No. 07245105 (“Nagayama”). Applicants respectfully traverse this rejection for at least the following reasons.

First, claim 1 was rejected in error because neither Mao nor Huang teaches a lithium compound deposited on a surface of the oxide, wherein the lithium compound is lithium sulfate, as required by claim 1.

Mao teaches a positive electrode active material layer comprising an oxide containing lithium and nickel, and a lithiated transition metal oxide material deposited on the surface of the oxide. *See* Mao at column 2, lines 55-58. In Mao, the lithiated transition metal oxide material is specifically lithium cobaltate or cobalt-doped lithium nickel oxide. Mao is quite clear that the lithiated transition metal oxide should contain cobalt, stating that “[c]oating the LiNiO₂ particles with lithium cobalt oxide or cobalt-doped lithium nickel oxide is preferred since cobalt is less sensitive to moisture than is nickel and since cobalt has a high charge efficiency and stable capacity.” *See* Mao at column 3, lines 7-10. Of course, lithium sulfate, the coating material claimed in claim 1, is not a lithiated transition metal oxide material, and thus Mao does not teach the combination of features recited in claim 1.

Huang does not remedy the deficiencies of Mao. The Examiner alleges that “it is well-known in the art that LiCoO₂ and lithium sulfate are common choices as lithium compounds for use with positive active materials as evidenced by Huang (Claim 5).” *See* Final Office Action dated October 27, 2010 at page 7. However, Huang does not, in fact, teach all that the Examiner alleges. Huang teaches that the positive electrode active material *itself* can be selected from an expansive list of materials that happens to include both lithium cobaltate and lithium sulfate. *See* Huang at claim 5. But nowhere does Huang teach that a lithium compound (much less lithium sulfate) is deposited on the surface of the oxide, as required by claim 1 of the present application. In fact, lithium sulfate is not even discussed anywhere in the Huang specification other than claim 5. Therefore, Huang does not remedy the deficiencies of Mao, and claim 1 is allowable over Mao and Huang.

Second, claim 1 was rejected in error because the Office failed to show that Mao, Huang, or Nagayama provides any motivation to combine the references. The Office alleges

that “it would have been obvious to one having ordinary skill in the art at the time of the invention to use lithium sulfate instead of LiCoO₂ to cover the oxide containing lithium and nickel as disclosed by Mao since one having ordinary skill in the art at the time of the invention would have had reasonable expectation of success in doing so as evidence by Huang (Claim 5)” and that “one having ordinary skill in the art at the time of the invention would have reasonably expected a success of inhibition of decomposition of the electrolyte solution since the contact surface of the oxide containing lithium and nickel is decreased (as evidenced by Nagayama [0022]”. *See* Final Office Action dated October 27, 2010 at page 7. Given the repeated use of the phrase “reasonable expectation of success” in the Office Action, Applicants infer that the Office rejected claim 1 using the “obvious to try” exemplary rationale, articulated in MPEP § 2143(E). However, the Office failed to make several of the finding necessary to reject claim 1 under this rationale.

For example, the Office failed to articulate a finding that, at the time of the invention, there had been a recognized problem or need in the art or a finding that there had been a finite number of identified, predictable potential solutions to the recognized need or problem, as required by MPEP § 2143(E). This is unsurprising, as there are an unfathomably large number of materials that could possibly be deposited on the surface of the oxide of claim 1. Mao suggested that these materials should only be chosen from lithiated transition metal oxide materials, but as evidenced by the present invention Mao missed the mark.

As for the requirement of a “reasonable expectation of success,” also mandated by MPEP § 2143(E), neither Huang nor Nagayama provides evidence for the requisite showing. As discussed above, Huang does not teach that a lithium compound (much less lithium sulfate) is deposited on the surface of the oxide. So why would a person of ordinary skill believe that such a deposited lithium compound would yield a successful positive electrode material? The simple answer is that he would not! Nagayama is similarly unavailing, as it singularly teaches depositing lithium carbonate on the surface of the oxide and does not suggest that success could be achieved with any other materials. Furthermore, the level of success achieved by Nagayama pales in comparison to the success achieved by the present invention, as discussed below.

Nor do Mao, Huang or Nagayama provide a motivation to combine under any other exemplary rationale. According to the MPEP, “the mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have

been predictable to one of ordinary skill in the art.” MPEP § 2143.01(III) (citing *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007)). Mao provides no motivation to combine because it stresses the importance of using lithium cobaltate due to its low sensitivity to moisture. Huang provides no motivation to combine because it makes no mention of depositing a lithium compound on an oxide. Nagayama provides no motivation to combine because it already teaches a lithium carbonate coating and gives no indication that another coating would be preferable. Furthermore, the results achieved by the combination of features in claim 1 would not have been predictable to one of ordinary skill in the art, as will next be discussed.

Third, the Patent Office erred when it dismissed the evidence of “unexpected results” provided in the Declaration of Takamitsu Saito, filed January 26, 2011 (“Saito Declaration”). The Saito Declaration provides strong evidence that the invention embodying claim 1 yields entirely “unexpected results.” Specifically, the Saito Declaration and experimental results shown therein demonstrate that an electrode material comprising an oxide containing lithium and nickel with lithium sulfate deposited on the oxide yields a surprisingly excellent “capacity sustainable rate.” A battery using the electrode material of claim 1 retains nearly 90% of its initial capacity after 1000 cycles, while a battery using an electrode material with lithium carbonate instead of lithium sulfate retains, at best, slightly over 60% of its initial capacity after 1000 cycles. In the Saito Declaration, Mr. Takamitsu Saito, a co-inventor with extensive experience in the design of non-aqueous electrolyte batteries, states that “[t]he superiority of lithium sulfate for this use was entirely unexpected.” *See* Saito Declaration at paragraph 5-7; *see also* Amendment and Reply Under 37 C.F.R. § 1.116 filed January 26, 2011 at pages 5-7. Yet, citing various informalities in the evidence, the Patent Office concluded that it “cannot determine if there are unexpected results” *See* Advisory Action mailed February 15, 2011 at Continuation Sheet.

The Federal Circuit has held that “when an applicant demonstrates substantially improved results . . . and states that the results were unexpected, this should suffice to establish unexpected results in the absence of evidence to the contrary.” *In re Soni*, 54 F.3d 746, 751 (Fed. Cir. 1995) (also holding that “[g]iven the presumption of similar properties for similar compositions, substantially improved properties are ipso facto unexpected.”). Applicants have demonstrated substantially improved results and stated, in the Saito

Declaration, that the results were unexpected, thus satisfying the criteria of *In re Soni*. This should suffice to establish unexpected results in the absence of evidence to the contrary.

The Office also alleges that “the evidence of unexpected results is deficient at least since it is not reasonably commensurate in scope with the prior art . . . because the evidence has a coating of lithium carbonate while Mao discloses a coating of lithium cobaltate.” See Advisory Action mailed February 15, 2011 at Continuation Sheet. The MPEP states that “[a]n affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the **closest prior art** to be effective to rebut a prima facie case of obviousness. MPEP § 716.02(e) (citing *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979)) (emphasis added). At the time the Saito Declaration was filed, the closest references cited by the Patent Office were Nagayama and U.S. Patent No. 5,427,875 (“Yamamoto”), both of which teach an electrode material comprising lithium nitride coated with lithium carbonate. This is why evidence was presented comparing lithium sulfate and lithium carbonate. This is all that is required by the MPEP, and thus the Office’s failure to give adequate weight to the Saito Declaration was a clear error.

III. Rejections of Claims 2, 3, and 6

Claims 2, 3, and 6 depend from independent claim 1, and are allowable for at least the same reasons as claim 1, even without regard for the further patentable features contained therein.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance.

Respectfully submitted,

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